

# Comparative Studies of the Growth Characteristics of *Macrobrachium macrobrachion* and *Macrobrachium vollenhovenii* in Forcados River Estuary, Niger Delta, Nigeria

E. Ogidiaka<sup>1\*</sup>, B. O. Bekederemo<sup>2</sup>, J. Atadiose<sup>3</sup>

<sup>1,2,3</sup>Fisheries and Fisheries Technology Option, Department of Science and Technology, Delta State School of Marine Technology, Burutu, Delta State, Nigeria

\*Corresponding Author: EfeOgis@yahoo.com, Tel.: +234-8063777441

Available online at: [www.isroset.org](http://www.isroset.org)

Received: 03/Sept/2018, Accepted: 12/Sept/2018, Online: 30/Sept/2018

**Abstract**— This study presents data on the growth characteristics of two important shrimps *Macrobrachium macrobrachion* and *Macrobrachium vollenhovenii* found in Forcados river estuary in Niger delta Nigeria. The parameters ‘a’ and ‘b’ of the length-weight relationship of *M. macrobrachion* were 0.97 and 2.15 for immature, 1.99 and 2.68 for female and 1.30 and 2.52 for male respectively while that of *M. Vollenhovenii* were 1.93 and 0.88 for immature, 1.91 and 0.86 for female and 1.07 and 0.712 for male respectively. Growth exhibited a negative allometric growth pattern for both species. The condition factor k was 9.83, 0.702 and 0.699 for immature, male and female respectively. The length-weight relationship parameters of *M. macrobrachion* and *M. Vollenhovenii* in Forcados River estuary revealed a strong association between the length and weight while the condition factor showed that the prawns were in good condition.

**Keywords** — Growth characteristics, Prawns, Estuary, Niger Delta.

## I. INTRODUCTION

*Macrobrachium macrobrachion* and *Macrobrachium vollenhovenii* are two economic important prawn species found in Forcados River estuary, Delta State, Nigeria. Both species are in the Phylum, *Arthropoda*; Class, *Crustacea*; Order, *Decapoda*; Family, *Palaemonida*; Genus, *Macrobrachium*; [1]. They are usually found in freshwater and waters with low salinity not exceeding 100/00. However, the larval stages of these species needs brackish water conditions for survival and optimum development [1] [2].

About 60% of the artisanal fisher folks of these species in Forcados River estuary are women who have reported a decline in catches in recent times. Cultivation of prawn is already well established in most developed countries of the world while the reverse is the case in Nigeria. Adequate hatchery systems are yet to be developed for production of their seeds which can be sourced easily from the wild.

This paper provides baseline data on a comparative study of the abundance and growth characteristics of *M. macrobrachion* and *M. Vollenhovenii* in Forcados River estuary of Delta State in view of obtaining information for women empowerment through aquaculture of these species in the Niger Delta region of Nigeria.

## II. RELATED WORK

Related research work has been conducted by other researchers in other parts of the country include [3; 4; 5; 6] but none to the best of my knowledge there is no data on a comparative study of the abundance and growth characteristics of *M. macrobrachion* and *M. Vollenhovenii* in Forcados River estuary, Niger Delta. Hence, the need for this study.

## III. METHODOLOGY

The study was conducted in Forcados River estuary area of Burutu. The area enjoys a tropical climate, with well demarcated rainy and dry seasons. The dry season stretches from November to April while the rainy season is usually from May to October [7]. The vegetation covers include *Eichhornia crassipes*, *Fern*, *Pistia*, *Cenchrus ciliaris*, *Nymphaea spp*, *Trapa spp*, *Lemna spp*, *Ceratophyllum spp*. Human activities here include fishing, bathing, swimming and wood/human transportation.

*M. macrobrachion* and *M. vollenhovenii* samples were obtained monthly from the catches of the artisanal fisher folk using traditional basket at Burutu between the dry season months of November 2015 to March, 2016. Biometric

measurement taken includes the total length (TL) measured to the nearest 0.1cm from the orbital notch to the tip of the telson using a Vernier calliper [8] [9] and the total weight (TW) using a sensitive Sartorius top loading balance (Model 1106) to the nearest 0.1g.

The length-weight relationship was calculated using the least square regression on log transformation given the equation:

$$\text{Log } W = \log a + b \log L \tag{1}$$

Where,

W = weight (g),

TL = total length (cm),

a = constant (intercept),

b = exponent (slope).

The Condition factor, k was calculated using this formula;

$$K = 100W/L^b \tag{2}$$

Where,

K= condition factor,

W = total weight (g),

L =total length (cm)

and b = the regression coefficient.

#### IV. RESULTS AND DISCUSSION

The length-weight relationship, coefficient of correlation (r) and condition factor (k) for the immature, female and male *M. macrobrachion* and *M. vollenhovenii* are shown in Table 1. The intercept (a) for *M. macrobrachion* and *M. vollenhovenii* ranged from 0.97-1.99 and 1.914-1.992 respectively. The growth exponent (b) ranged from 2.1451-2.68 in *M. macrobrachion* and 1.07-1.91 in *M. vollenhovenii* indicating negative allometric growth. The r value ranged from 0.6355-0.6653 for *M. macrobrachion* and 0.715-0.864 for *M. vollenhovenii*. The condition factor ranged from 0.699-9.83 and 0.37-0.94 for *M. macrobrachion* and *M. vollenhovenii* respectively.

Table 1: Parameters of length-weight relationship of *Macrobrachium macrobrachion* and *Macrobrachium vollenhovenii* in Forcados River estuary during the study period.

Sex	Numbers examined (n)	Length range (cm)			Weight range (g)			Intercept (a)	Slope (b)	Correlation coefficient (r)	Condition factor (k)
		Min	Max	Mean	Min	Max	Mean				
<b><i>M. macrobrachion</i></b>											
Immature	96	1.9	8.2	3.752	0.1	3.7	0.519	0.97	2.15	0.6355	9.83
Female	63	4.8	8.6	6.522	0.7	4.2	1.949	1.99	2.68	0.6643	0.702
Male	170	2	11.5	6.414	0.1	5.2	1.844	1.30	2.52	0.6653	0.699
<b><i>M. vollenhovenii</i></b>											
Immature	103	1.97	10.2	7.3	1.6	2.2	1.01	1.93	0.88		
Female	123	6	13.9	9.23	1.3	3.9	1.992	1.91	0.863	0.37	Female
Male	210	5.4	15	8.51	0.7	7.2	1.914	1.07	0.715	0.94	Male

This length range of *M. Vollenhovenii* confirms that this species is one of the largest prawns in Nigeria waters and this result is higher than reports from Lower Taylor Creek [3]. The weight range for the female sexes of *M. macrobrachion* and *M. vollenhovenii* m was 0.7-4.2g and 1.3-3.9g while the male prawns recorded a range of 0.1-5.2g and 0.7-7.2g. This findings is however, lower than reports from lower Taylor Creek [3]. The b value for both male and female of *M. macrobrachion* and *M. vollenhovenii* exhibited negative allometric growth pattern indicating that the prawns grew thinner as it increases in length. Positive allometric growth pattern was recorded by [3] in lower Taylor Creek for *M. vollenhovenii*. [4], recorded isometric growth pattern for female *M. vollenhovenii* at Ovia River, Niger Delta, Nigeria. Perfect isometric growth pattern rarely occur in nature [8]

[9]. Most aquatic organisms change shape as they grow [10]. The “r” value was 0.863 and 0.715 for the female and male respectively indicating high relationship between the length and weight. This result is lower than reports from Ovia River [4]. Similarly, negative allometric growth pattern in prawn was also recorded by [11] in Buguma creek in the Niger Delta, Nigeria, [5] in Lagos-Lekki lagoon, [6] in Luubara creek, Ogoni Land, Niger Delta and [14] in Iko River estuary. The k value recorded for both species were relatively low and can be attributed to the reproductive period. [15] reported that there is usually a drop in the mean values of the condition factor of *M. vollenhovenii* as a result in decrease in feeding activity during reproductive period.

## V. CONCLUSION AND FUTURE SCOPE

The study revealed that both species studied were in good conditions and their seeds can be sourced from the wild by artisanal fisher folks for aquaculture purposes. However, *M. vollenhovenii* is recommended since they attain much bigger size compared to *M. macrobrachion*. In addition, more research needs to be carried out on these species for a longer period to confirm this preliminary finding.

### ACKNOWLEDGMENT

The authors are grateful to K. Ajiwuni for assistance with some of the laboratory analysis.

### REFERENCES

- [1]. C.B. Powell, "Fresh and brackish water shrimps of economic importance in the Niger Delta". In the Proceedings of 1982 Fisheries Society of Nigeria, Nigeria, 1982.
- [2]. M.B. New, S. Singholka, "Freshwater prawn farming: a manual for the culture of *Macrobrachium rosenbergii*". FAO Fish Technical Paper 118, 1985.
- [3]. T. Kingdom, A.I., Hart, E.S. Erondu, K. Kwen, "Morphology and condition indices of *Macrobrachium* species in the in the lower Taylor Creek, Niger Delta, Nigeria." International Journal of Fisheries and Aquatic Studies, Vol.1 Issue 6, pp. 95-103, 2014.
- [4]. F.A.R. Ehigiator, A., Obi, "Length-Weight relationship and Fulton's condition factor of *M. vollenhovenii* in Ovia River, Niger Delta, Nigeria." Nigerian Journal of Agriculture, Food and Environment. Vol. 9 Issue 1, pp. 50-55, 2013.
- [5]. P.O. Abohyere, A.B. Williams, "Length-weight relationship and condition factor of *Macrobrachium macrobrachion* in the Lagos-Lekki lagoon system, Nigeria". Research Journal of Biological Sciences, Vol.3 Issue 11, pp. 1333-1336, 2008.
- [6]. S. N. Deekae, J. F. N. Abowei, "The Fecundity of *Macrobrachium macrobrachion* (Herklots, 1851) from Luubara Creek, Ogoni Land, Niger Delta, Nigeria". International Journal of Animal and Veterinary Advances, Vol 2 Issue 4 pp 148-154, 2010.
- [7]. F.I. Opute, "Contribution to the knowledge of algae of Nigeria. I. Desmids from the Warri/Forcados Estuaries. Part II. The elongate baculiform desmids". Journal of Limnology, Vol. 59 Issue 2, pp.131-155, 2000.
- [8]. L.B. Holthius, "FAO Species Catalogues. Vol 1, Shrimps and prawns of the world. An annotated catalogue species of interest to fisheries," FAO Fish Synopsis – 271, 1980.
- [9]. FAO., "FAO Species identification sheets for Fishery purposes". Department of Fisheries and Oceanic, Canada. Fishing Areas 34, 47 (in part) (F.C. Atlantic), 13, 1981.
- [10]. T.B. Bagenal, , "Aspects of fish fecundity". In: Gerking, S.D.(ed) Ecology of freshwater fish Production. Blackwell Scientific Publications. Oxford. pp 75–101, 1978.
- [11]. E.A. Basse, P.K. Ricardo, "Seasonality in growth of *Aphyosemion gradneri* (Bolenger) in Mfangmfang pond in Uyo, Nigeria". The Zoologist, Vol.2, pp. 68-75, 2003.
- [12]. J. Thomas, S. Venus, B.M. Kurup, "Length-Weight relationship of some deep sea fishes inhabiting the continental slope beyond 250m depth along west coast of India". Naga. ICLARM Q., Vol.26, pp. 17-21, 2003.
- [13]. A. S. Yakubu, E. J. Ansa, "Length-weight relationship of the Pink Shrimp and Giant shrimp, *Peneaus monodan* of Buguma Creek in *Peneaus notialis* the Niger Delta, Nigeria". The Zoologist, Vol.5, pp.47-53, 2007.

- [14]. E. P. Udoinyang, O. Amali, C. C. Iheukwumere, J. E. Ukpatu, "Length-weight relationship and condition factor of seven shrimp species in the artisanal shrimp fishery of Iko river estuary, Southeastern Nigeria". International Journal of Fisheries and Aquatic Studies, Vol.4 Issue 2, pp. 109-114, 2016.
- [15]. F.M.S. Braga, O., Gennari-Filho, "Contribuc~ao para o conhecimento da reproduc~ao de *Moenkhausia intermedia* (Characidae, Tetragonopterinae) na represa de Barra Bonita, rio Piracicaba, SP. Naturalia, Vol.15, pp. 171–188, 1990.

### AUTHORS PROFILE

E. Ogidiaka pursued B. Sc. And M Sc., Zoology from Delta State University, Abraka, Delta State, Nigeria and University of Ibadan, Oyo State, Nigeria in 2005 & 2009 respectively. She is currently working as a Lecturer in Department of Fisheries and Fisheries Technology Delta State School of Marine Technology, Burutu, Delta State, Nigeria since 2011. She has published more than 10 research papers in reputed local and international journals. She has over 7 years of teaching and research experience. Her research work focuses on aquatic ecology, aquatic biology and related fields.

Mrs B O Bekederemo has B. Sc Zoology, M. Sc Fisheries from Edo state University, Ekpoma and University of Benin, Benin City in 2003, 2012. She is currently working as a lecturer/HOD in the Department of Fisheries from Delta State School of Marine Technology, Burutu since 2011. She is a member of Fison. She has published more than 10 research papers in journals and conferences. Her research work focuses on aquatic resources management and related fields. She has 7 years of teaching experience and 5 years of research experience.

J. Atadiose obtained B. Fisheries from University of Maiduguri, Maiduguri, Nigeria and currently running an M Sc program in Hydro and Fish Biology in University of Benin, Benin Edo State, Nigeria. He is currently working as a lecturer in Department of Fisheries and Fisheries Technology Delta State School of Marine Technology, Burutu, Delta State, Nigeria since 2011. He has published more than 9 research papers in reputed international and local journals. He has over 7 years of teaching and research experience. His research work focuses on fisheries and related fields.